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Robotic Laparoscopic Single-site Partial Nephrectomy: Almost Like Driving with the Steering Lock Engaged

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Because of its wide use and acceptance, open nephron-sparing surgery (NSS) with a minimal tumor-free margin is still considered the cornerstone in the contemporary management of intracapsular renal cell carcinomas (RCCs) ≤ 7 cm in diameter (T1 stage). However, the advent of the robotic platform is changing, and will continue to change, the approach to NSS. Indeed, robotic partial nephrectomy (RPN) has reduced the technical challenges of traditional laparoscopy, allowing superior surgical results compared with laparoscopic partial nephrectomy (LPN), especially by reducing the warm ischemia time (WIT). Data from a recent meta-analysis with 717 patients found no statistical difference between LPN and RPN for most of the outcome parameters except for WIT, favoring the RPN group with less time needed [1].

Recent studies have also shown that RPN can be effectively used for the treatment of larger renal tumors (>4 cm in diameter) and in cases of parahilar lesions [2]. Therefore, the possibility of combining the undebatable advantages of minimal invasiveness with the highly encouraging early to intermediate outcomes makes RPN the main realistic ideal substitute for the actual gold standard, open partial nephrectomy [3]. The approach is intuitive, and thus its use can flatten the learning curve and reduce potential surgical complications [4]. Thanks to the three-dimensional vision and the EndoWrist technology that allows for dissecting the tissue optimally by varying the degree of incidence with the target structures, the robotic platform fills the previously existing gap between the fine human hand movements and the limited movements of the classic laparoscopic instruments.

In particular, laparoendoscopic single-site (LESS) partial nephrectomy (PN) is very demanding, even for very skilled

laparoscopic surgeons. To overcome the LESS difficulties first reported by Kaouk et al. in 2009, some authors have focused their interest on robotic LESS (R-LESS) PN, due to the higher reproducibility of the technique compared to standard LESS, maintaining a theoretically better cosmetic result, less scarring, and faster return to ordinary activities [5]. Tiu et al. reported on 67 cases of R-LESS PN; 47 cases were RCC <4 cm (group A), and 20 cases were RCC >4 cm (group B). Groups A and B had a mean WIT of 24 min (range: 12–65 min) and 31 min (range: 14–41 min), respectively; the mean length of stay was 4 d (range: 2–8 d) and 5.3 d (range: 3–11 d), respectively. There was a mean percentage decrease in the estimated glomerular filtration rate (eGFR) at 3 mo and 6 mo of 9% and 13% and 6% and 15%, respectively [6].

In this issue of *European Urology*, Komninos et al. [7] report data from a retrospective single-center, single-surgeon comparative study between RPN and R-LESS PN. The primary outcome measurement was trifecta achievement, defined as WIT <20 min, negative surgical margins, and no surgical complications; the secondary outcome was the perioperative and postoperative comparison between groups [7]. In the study, in line with the literature, the authors report a significantly longer mean operative time (208 ± 83 min vs 173 ± 75.8 min), a significantly longer WIT (26.5 ± 10.5 min vs 20.2 ± 12.8 min), and an increased eGFR percentage change ($-21\% \pm 17.2\%$ vs $-14.7\% \pm 19\%$) in the R-LESS PN group compared with the standard multiport RPN group [7]. When considering the simultaneous achievement of the trifecta outcome, again R-LESS PN showed significant inferiority to standard multiport RPN (25.6% vs 42.7%) [7]. The authors conclude that based on the results of their study, the R-LESS PN

procedure should not be routinely adopted in all cases when using the current robotic platform [7].

The authors should be complimented for their study, since the comparison between R-LESS PN and standard RPN is a current hot topic with several controversies. The article is methodologically correct and balanced. However, some major remarks are worthy of notice. The single-surgeon series avoids the surgical bias, but the long time frame (6 yr) raises some uncertainty about the homogeneity of treatment, as both R-LESS PN and standard RPN (and especially R-LESS PN) were very innovative surgical procedures in 2006. Therefore trials and errors could have happened at the beginning of their experience. Indeed, the surgical skill of the surgeon probably improved during these 6 yr. Further limitations of the paper reside in its retrospective nature and in the low statistical power of the small study population. However, if the ultimate goal of RPN is renal function preservation, we fully agree with the conclusions, since the current da Vinci system (Intuitive Surgical Inc., Sunnyvale, CA, USA) is not designed to be used in this fashion.

The main disadvantage of the current R-LESS PN technique is the internal and external collision of the robotic arms. Some authors also report a significant gas leak and insufficient tissue retraction because of the absence of a fourth robotic arm [8]. The need for constantly repositioning the camera, together with the two operative arms, the restricted space for the bedside assistant, the narrower operative field available, and the limited spatial movements, make R-LESS surgery almost like driving a car with the steering lock engaged. This characteristic inevitably renders the procedure less performative, unreasonably more challenging, and much riskier. Again, if the goal of NSS is renal function preservation, this goal can be best achieved by minimizing WIT (which should always be <20 min) and by maximizing healthy parenchymal preservation, thus leaving a minimal visible rim of tumor margin around the tumor and paying close attention to avoid positive surgical margins [9].

WIT after R-LESS PN is still far from optimal, especially when the multiport counterpart provides significantly better outcomes, as reported by Komninos and associates [6,7]. However, it is difficult to see the clinical reason for limiting the performance of the currently most advanced minimal invasive platform, which has proven equivalent perioperative, early oncologic, and functional outcomes compared with the open approach in the multiport configuration, as reported in a recent multicenter matched-pair analysis of 400 patients [10]. Is it the debatable superior cosmetic result or the even more debatable less invasiveness of R-LESS PN? As Komninos et al. [7] state in their report, the “most favorable outcomes that can be achieved following RPN are the triple goals of negative surgical margins, functional preservation and complication-free recovery, that is, trifecta accomplishment.”

R-LESS PN still needs several refinements to be able to obtain an acceptable trifecta outcome, along with a new concept design, as at present its role is still unclear.

However, R-LESS surgeons should be complimented, since thanks to their efforts, the critical aspects of this technique are coming to light, and only in this way will a future evolution be possible. Recently, the VeSPA surgical instruments (Intuitive Surgical Inc.), designed to be used with the da Vinci Si system, have been evaluated for use in radical nephrectomy, pyeloplasty, and PN in the porcine model. The VeSPA surgical instruments have a semirigid shaft that allows them to be inserted through curved cannulas. Instrument clashing is reduced, but these new instruments are not equipped with an articulating tip, making intracorporeal suturing challenging.

Certain refinements are necessary to obtain greater ergonomic advantages during R-LESS PN and allow less instrument clashing and wider range of motion; examples include a telescopic camera, with a zoom-in and zoom-out option, that is inserted $\leq 1\text{--}2$ cm through the abdominal wall; setting the system to a fine-tuning mode to reduce external movement of the robotic arms; and the use of $\leq 5\text{-mm}$ curved articulated robotic instruments. Therefore, further significant improvements, along with more studies, are welcome and are needed to establish the future role of the R-LESS technique.

Conflicts of interest: The authors have nothing to disclose.

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